

SEQUENCE LISTING



<110> TONOUCHI, NAOTO
SUZUKI, SONOKO
YOKOZEKI, KENZO
NOZAKI, HIROYUKI
SUGIYAMA, MASAKAZU

<120> PEPTIDE-FORMING ENZYME GENE, PEPTIDE-FORMING ENZYME, AND PEPTIDE
PRODUCING METHOD

<130> 247264US0CONT

<140> 10/763,249
<141> 2004-01-26

<150> PCT/JP02/07635
<151> 2002-07-26

<150> JP 2001-226568
<151> 2001-07-26

<150> JP 2001-310547
<151> 2001-10-05

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<170> PatentIn version 3.3

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Pro Leu Thr Glu Asp Val Ala Asp Glu Xaa Arg Xaa Glu Xaa
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Thr	Lys	Thr	Leu	Gly	Ser	Leu	Gln	Leu	Glu	Glu	Ile	Thr	Leu	Thr	Leu	
			5					10					15			
cct	ctg	act	gaa	gat	gtg	gcc	gat	gaa	cgc	acc	att	gat	gtg	ttc	gca	155
Pro	Leu	Thr	Glu	Asp	Val	Ala	Asp	Glu	Arg	Thr	Ile	Asp	Val	Phe	Ala	
		20					25					30				
cgc	att	gcc	aca	cgc	gtc	ggt	ggg	gaa	gac	ctt	cca	tat	tta	gta	ttc	203
Arg	Ile	Ala	Thr	Arg	Val	Gly	Gly	Glu	Asp	Leu	Pro	Tyr	Leu	Val	Phe	
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ctg	cag	ggt	ggg	cct	ggc	aat	gaa	gct	cca	cgt	cca	agc	ctt	aat	ccc	251
Leu	Gln	Gly	Gly	Pro	Gly	Asn	Glu	Ala	Pro	Arg	Pro	Ser	Leu	Asn	Pro	
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ctc	aac	ccc	aat	tgg	ttg	ggc	gtg	gcc	ttg	gag	gaa	tac	cgc	gtg	gtc	299
Leu	Asn	Pro	Asn	Trp	Leu	Gly	Val	Ala	Leu	Glu	Glu	Tyr	Arg	Val	Val	
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atg	ttg	gat	caa	cgt	ggc	acc	ggc	cgt	tcc	acc	cca	gtg	ggt	aat	gat	347
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Ile	Leu	Glu	Lys	Pro	Thr	Ala	Glu	Val	Val	Glu	Tyr	Leu	Ser	His	Leu	
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cgc	gca	gat	ggc	att	gtg	cga	gat	gct	gaa	gcc	ctg	cgt	aag	cat	ttg	443
Arg	Ala	Asp	Gly	Ile	Val	Arg	Asp	Ala	Glu	Ala	Leu	Arg	Lys	His	Leu	
	115					120					125					
ggt	gtg	aat	cag	tgg	aac	ctt	tta	ggc	cag	tcc	ttc	gga	ggt	ttc	acc	491
Gly	Val	Asn	Gln	Trp	Asn	Leu	Leu	Gly	Gln	Ser	Phe	Gly	Gly	Phe	Thr	
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Thr	Leu	His	Tyr	Leu	Ser	Arg	His	Ala	Asp	Ser	Leu	Asp	Asn	Val	Phe	
				150					155					160		
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Ile	Thr	Gly	Gly	Leu	Ser	Ala	Ile	Asp	Arg	Pro	Ala	Glu	Asp	Val	Tyr	
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cgc	ttc	ccg	caa	tta	cgg	gaa	act	ttc	cga	ggg	ttg	gtt	aat	cgt	gct	683
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Asp	Leu	Tyr	Asn	Leu	Leu	Glu	Leu	Asp	Pro	Thr	Ser	Asn	Ala	Phe	Val	
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His	Asp	Leu	Ala	Gly	Leu	Leu	Pro	Phe	Gly	Asn	Arg	Asn	Pro	Ile	Tyr	
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tac	gtg	ctc	cat	gag	tcc	tct	tac	gcc	gac	ggg	gtg	gtg	aca	aat	tgg	923
Tyr	Val	Leu	His	Glu	Ser	Ser	Tyr	Ala	Asp	Gly	Val	Val	Thr	Asn	Trp	
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gca	gca	gag	cgt	gtg	ctt	cca	gag	gat	ttc	cgc	gag	gat	cca	aca	ctg	971
Ala	Ala	Glu	Arg	Val	Leu	Pro	Glu	Asp	Phe	Arg	Glu	Asp	Pro	Thr	Leu	
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ctc	acc	ggg	gag	cac	gtg	ttc	cag	gag	tgg	aca	gac	acc	gtg	ccg	tcg	1019
Leu	Thr	Gly	Glu	His	Val	Phe	Gln	Glu	Trp	Thr	Asp	Thr	Val	Pro	Ser	
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ctc	aag	ccg	tgg	aag	gac	gtt	gcc	ctg	gca	ttg	gct	cag	cag	gaa	tgg	1067
Leu	Lys	Pro	Trp	Lys	Asp	Val	Ala	Leu	Ala	Leu	Ala	Gln	Gln	Glu	Trp	
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Pro	Lys	Leu	Tyr	Asp	Ala	Lys	Ala	Leu	Glu	Asn	Ser	Gln	Ala	Lys	Gly	
		340					345					350				
gct	gca	gca	gtg	tat	ghc	aat	gac	gtt	ttc	gtc	cca	gtg	gat	tac	tct	1163
Ala	Ala	Ala	Val	Tyr	Xaa	Asn	Asp	Val	Phe	Val	Pro	Val	Asp	Tyr	Ser	
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ctg	gaa	acc	gca	caa	cac	ctg	ccc	ggg	gtg	cag	ctg	ttt	atc	acc	agc	1211
Leu	Glu	Thr	Ala	Gln	His	Leu	Pro	Gly	Val	Gln	Leu	Phe	Ile	Thr	Ser	
370					375					380					385	
cag	cat	gaa	cac	aat	gga	ctt	cgt	gcc	agc	tca	ggc	gca	gta	ctg	rag	1259
Gln	His	Glu	His	Asn	Gly	Leu	Arg	Ala	Ser	Ser	Gly	Ala	Val	Leu	Xaa	
				390				395						400		

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 35 40 45

Phe Leu Gln Gly Gly Pro Gly Asn Glu Ala Pro Arg Pro Ser Leu Asn
 50 55 60

Pro Leu Asn Pro Asn Trp Leu Gly Val Ala Leu Glu Glu Tyr Arg Val
 65 70 75 80

Val Met Leu Asp Gln Arg Gly Thr Gly Arg Ser Thr Pro Val Gly Asn
 85 90 95

Asp Ile Leu Glu Lys Pro Thr Ala Glu Val Val Glu Tyr Leu Ser His
 100 105 110

Leu Arg Ala Asp Gly Ile Val Arg Asp Ala Glu Ala Leu Arg Lys His
 115 120 125

Leu Gly Val Asn Gln Trp Asn Leu Leu Gly Gln Ser Phe Gly Gly Phe
 130 135 140

Thr Thr Leu His Tyr Leu Ser Arg His Ala Asp Ser Leu Asp Asn Val
 145 150 155 160

Phe Ile Thr Gly Gly Leu Ser Ala Ile Asp Arg Pro Ala Glu Asp Val
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Tyr Ala Asn Cys Tyr Asn Arg Met Arg Arg Asn Ser Glu Glu Phe Tyr
 180 185 190

Arg Arg Phe Pro Gln Leu Arg Glu Thr Phe Arg Gly Leu Val Asn Arg
 195 200 205

Ala Arg Ala Gly Glu Ile Val Leu Pro Thr Gly Glu Val Val Ser Glu
 210 215 220

Thr Arg Leu Arg Ser Leu Gly His Leu Leu Gly Ser Asn Asp Gly Trp
 225 230 235 240

Phe Asp Leu Tyr Asn Leu Leu Glu Leu Asp Pro Thr Ser Asn Ala Phe
 245 250 255

Val His Asp Leu Ala Gly Leu Leu Pro Phe Gly Asn Arg Asn Pro Ile
 260 265 270

Tyr Tyr Val Leu His Glu Ser Ser Tyr Ala Asp Gly Val Val Thr Asn
 275 280 285

Trp Ala Ala Glu Arg Val Leu Pro Glu Asp Phe Arg Glu Asp Pro Thr
 290 295 300

Leu Leu Thr Gly Glu His Val Phe Gln Glu Trp Thr Asp Thr Val Pro
 305 310 315 320

Ser Leu Lys Pro Trp Lys Asp Val Ala Leu Ala Leu Ala Gln Gln Glu
325 330 335

Trp Pro Lys Leu Tyr Asp Ala Lys Ala Leu Glu Asn Ser Gln Ala Lys
340 345 350

Gly Ala Ala Ala Val Tyr Xaa Asn Asp Val Phe Val Pro Val Asp Tyr
355 360 365

Ser Leu Glu Thr Ala Gln His Leu Pro Gly Val Gln Leu Phe Ile Thr
370 375 380

Ser Gln His Glu His Asn Gly Leu Arg Ala Ser Ser Gly Ala Val Leu
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Xaa His Leu Phe Asp Leu Ala His Gly Arg Glu Val Arg
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 Met Met Pro Asn Gly Ser Gln Tyr Pro His Thr Glu Cys Ala Met
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 cag acc ctc tac ccg cag atc aaa ccc tac gcc cgg cac gat ctg gcc 578

Gln	Thr	Leu	Tyr	Pro	Gln	Ile	Lys	Pro	Tyr	Ala	Arg	His	Asp	Leu	Ala	
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Val	Glu	Ala	Pro	His	Val	Leu	Tyr	Val	Asp	Glu	Ser	Gly	Ser	Pro	Glu	
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ggc	ctg	ccc	gtg	gta	ttc	atc	cac	ggc	ggc	ccg	ggc	gct	ggc	tgc	gac	674
Gly	Leu	Pro	Val	Val	Phe	Ile	His	Gly	Gly	Pro	Gly	Ala	Gly	Cys	Asp	
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gcc	cag	agc	cgt	tgc	tac	ttt	gac	ccc	aac	ctg	tac	cgc	atc	atc	acc	722
Ala	Gln	Ser	Arg	Cys	Tyr	Phe	Asp	Pro	Asn	Leu	Tyr	Arg	Ile	Ile	Thr	
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Phe	Asp	Gln	Arg	Gly	Cys	Gly	Arg	Ser	Thr	Pro	His	Ala	Ser	Leu	Glu	
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Asn	Asn	Thr	Thr	Trp	His	Leu	Val	Glu	Asp	Leu	Glu	Arg	Ile	Arg	Glu	
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cac	ctg	ggc	atc	gac	aaa	tgg	gtg	ctg	ttc	ggc	ggc	tcg	tgg	ggc	tcg	866
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acc	ctg	gcc	ctg	gcc	tac	gcc	cag	acc	cac	ccc	gag	cgt	gtg	cat	ggg	914
Thr	Leu	Ala	Leu	Ala	Tyr	Ala	Gln	Thr	His	Pro	Glu	Arg	Val	His	Gly	
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Leu	Ile	Leu	Arg	Gly	Ile	Phe	Leu	Cys	Arg	Pro	Gln	Glu	Ile	Glu	Trp	
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Tyr	Ile	Ala	Pro	Ile	Pro	Pro	Glu	Glu	Arg	Gly	Asp	Leu	Val	Lys	Ala	
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ttc	cac	aag	cgc	ctc	acc	ggc	aac	gat	cag	att	gcc	cag	atg	cac	gcc	1106
Phe	His	Lys	Arg	Leu	Thr	Gly	Asn	Asp	Gln	Ile	Ala	Gln	Met	His	Ala	
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Ala	Lys	Ala	Trp	Ser	Thr	Trp	Glu	Gly	Arg	Thr	Ala	Thr	Leu	Arg	Pro	
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Asn Pro Leu Val Val Asp Arg Phe Ser Glu Pro Gln Arg Ala Leu Ser	
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atc gcc cgg atc gag tgc cac tac ttc atg aac aac gcc ttc ctc gaa	1250
Ile Ala Arg Ile Glu Cys His Tyr Phe Met Asn Asn Ala Phe Leu Glu	
240 245 250 255	
ccg gac cag ttg atc cgc gac ctg ccg aag atc gcc cac ctg cca gcg	1298
Pro Asp Gln Leu Ile Arg Asp Leu Pro Lys Ile Ala His Leu Pro Ala	
260 265 270	
gtg atc gtg cac ggt cgc tat gac gtg atc tgt ccg ctg gac aac gcc	1346
Val Ile Val His Gly Arg Tyr Asp Val Ile Cys Pro Leu Asp Asn Ala	
275 280 285	
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Trp Ala Leu His Gln Ala Trp Pro Asn Ser Glu Leu Lys Val Ile Arg	
290 295 300	
gac gcc ggc cac gcc gcg tcc gag ccg ggc atc acc gat gcc ctg gtg	1442
Asp Ala Gly His Ala Ala Ser Glu Pro Gly Ile Thr Asp Ala Leu Val	
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Arg Ala Ala Asp Gln Met Ala Arg Arg Leu Leu Asp Leu Pro Leu Glu	
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 35 40 45

Leu Pro Val Val Phe Ile His Gly Gly Pro Gly Ala Gly Cys Asp Ala
 50 55 60

Gln Ser Arg Cys Tyr Phe Asp Pro Asn Leu Tyr Arg Ile Ile Thr Phe
 65 70 75 80

Asp Gln Arg Gly Cys Gly Arg Ser Thr Pro His Ala Ser Leu Glu Asn
 85 90 95

Asn Thr Thr Trp His Leu Val Glu Asp Leu Glu Arg Ile Arg Glu His
 100 105 110

Leu Gly Ile Asp Lys Trp Val Leu Phe Gly Gly Ser Trp Gly Ser Thr
 115 120 125

Leu Ala Leu Ala Tyr Ala Gln Thr His Pro Glu Arg Val His Gly Leu
 130 135 140

Ile Leu Arg Gly Ile Phe Leu Cys Arg Pro Gln Glu Ile Glu Trp Phe
 145 150 155 160

Tyr Gln Glu Gly Ala Ser Arg Leu Phe Pro Asp Tyr Trp Gln Asp Tyr
 165 170 175

Ile Ala Pro Ile Pro Pro Glu Glu Arg Gly Asp Leu Val Lys Ala Phe
 180 185 190

His Lys Arg Leu Thr Gly Asn Asp Gln Ile Ala Gln Met His Ala Ala
 195 200 205

Lys Ala Trp Ser Thr Trp Glu Gly Arg Thr Ala Thr Leu Arg Pro Asn
 210 215 220

Pro Leu Val Val Asp Arg Phe Ser Glu Pro Gln Arg Ala Leu Ser Ile
 225 230 235 240

Ala Arg Ile Glu Cys His Tyr Phe Met Asn Asn Ala Phe Leu Glu Pro
 245 250 255

Asp Gln Leu Ile Arg Asp Leu Pro Lys Ile Ala His Leu Pro Ala Val
 260 265 270

Ile Val His Gly Arg Tyr Asp Val Ile Cys Pro Leu Asp Asn Ala Trp
 275 280 285

Ala Leu His Gln Ala Trp Pro Asn Ser Glu Leu Lys Val Ile Arg Asp
 290 295 300

Ala Gly His Ala Ala Ser Glu Pro Gly Ile Thr Asp Ala Leu Val Arg
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Ala Ala Asp Gln Met Ala Arg Arg Leu Leu Asp Leu Pro Leu Glu Glu
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Ala

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tttatgatgc cagacggcaa aataatagac gtccccccag ggatggaccc gaccccttac 300
ggagcgcgca atg cag act ttg tac ccg cag atc aaa ccc tac gtc cgg 349
      Met Gln Thr Leu Tyr Pro Gln Ile Lys Pro Tyr Val Arg
        1             5             10

cac gat ctg gcc gtc gat gaa acc cac acg ctg tat gtc gac gaa agt 397
His Asp Leu Ala Val Asp Glu Thr His Thr Leu Tyr Val Asp Glu Ser
      15             20             25

ggg tcc ccg caa ggt ttg ccc gtg gtc ttc atc cat ggc ggt ccc ggc 445
Gly Ser Pro Gln Gly Leu Pro Val Val Phe Ile His Gly Gly Pro Gly
      30             35             40             45

gcc ggc tgc gat gcc aat agc cgc tgc tat ttc gat ccg aac ctg tac 493
Ala Gly Cys Asp Ala Asn Ser Arg Cys Tyr Phe Asp Pro Asn Leu Tyr
              50             55             60

cgc atc gtc acc ttt gac cag cgc ggc tgc ggg cgc tcc act ccg ccg 541
Arg Ile Val Thr Phe Asp Gln Arg Gly Cys Gly Arg Ser Thr Pro Arg
              65             70             75

gcc agc ctg gaa aac aac acc acc tgg gac ctg gtt gcc gac ctt gag 589
Ala Ser Leu Glu Asn Asn Thr Thr Trp Asp Leu Val Ala Asp Leu Glu
      80             85             90

cgc att cgc gag cac ctg ggg att gaa aaa tgg gtg ctg ttc ggt ggt 637
Arg Ile Arg Glu His Leu Gly Ile Glu Lys Trp Val Leu Phe Gly Gly
      95             100             105

tcc tgg ggc tcg acc ctg gcc ctg gcc tat gca caa acc cac cct gat 685
Ser Trp Gly Ser Thr Leu Ala Leu Ala Tyr Ala Gln Thr His Pro Asp
      110             115             120             125

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cgc	gtg	ctt	ggc	ctg	att	gtg	cgc	ggc	atc	ttc	ctg	gcc	cgc	ccc	cag	733
Arg	Val	Leu	Gly	Leu	Ile	Val	Arg	Gly	Ile	Phe	Leu	Ala	Arg	Pro	Gln	
				130					135					140		
gat	atc	cag	tgg	ttc	tac	cag	gcc	ggc	gcg	agc	cgc	ctg	ttc	ccg	gac	781
Asp	Ile	Gln	Trp	Phe	Tyr	Gln	Ala	Gly	Ala	Ser	Arg	Leu	Phe	Pro	Asp	
			145					150					155			
tac	tgg	cag	gac	tac	atc	gcg	cca	atc	ccg	gcg	gaa	gag	cgc	cac	gac	829
Tyr	Trp	Gln	Asp	Tyr	Ile	Ala	Pro	Ile	Pro	Ala	Glu	Glu	Arg	His	Asp	
		160					165					170				
atg	atc	agc	gcc	tac	cac	aag	cgc	ctg	acc	ggc	aat	gac	cag	atc	gcc	877
Met	Ile	Ser	Ala	Tyr	His	Lys	Arg	Leu	Thr	Gly	Asn	Asp	Gln	Ile	Ala	
	175					180					185					
cag	atg	cat	gcc	gcc	aag	gcc	tgg	tcc	acc	tgg	gaa	ggc	cgc	atg	ctc	925
Gln	Met	His	Ala	Ala	Lys	Ala	Trp	Ser	Thr	Trp	Glu	Gly	Arg	Met	Leu	
190					195					200					205	
ggc	ctg	tgc	ccc	agc	ccg	cag	ctg	atc	gag	cgc	ttc	tcc	gag	ccc	cag	973
Gly	Leu	Cys	Pro	Ser	Pro	Gln	Leu	Ile	Glu	Arg	Phe	Ser	Glu	Pro	Gln	
				210					215					220		
cgc	gcg	ttg	tcg	att	gcg	cgc	atc	gag	tgc	cac	tac	ttc	acc	aat	aac	1021
Arg	Ala	Leu	Ser	Ile	Ala	Arg	Ile	Glu	Cys	His	Tyr	Phe	Thr	Asn	Asn	
			225					230					235			
tcg	ttc	ctg	gag	ccc	aac	cag	ctg	att	cgc	gat	atg	cac	aag	atc	gcc	1069
Ser	Phe	Leu	Glu	Pro	Asn	Gln	Leu	Ile	Arg	Asp	Met	His	Lys	Ile	Ala	
		240					245					250				
cat	ctg	ccg	ggg	atc	atc	gtg	cat	ggc	cgc	tac	gat	atg	atc	tgc	ccg	1117
His	Leu	Pro	Gly	Ile	Ile	Val	His	Gly	Arg	Tyr	Asp	Met	Ile	Cys	Pro	
	255					260					265					
ctg	gat	aat	gcc	tgg	gag	ctg	cac	cag	gcc	tgg	ccg	aac	agt	gag	ttg	1165
Leu	Asp	Asn	Ala	Trp	Glu	Leu	His	Gln	Ala	Trp	Pro	Asn	Ser	Glu	Leu	
270					275				280						285	
cag	gtg	atc	cgc	gag	gcg	ggc	cac	gcg	gcg	tcc	gag	ccg	ggc	atc	acc	1213
Gln	Val	Ile	Arg	Glu	Ala	Gly	His	Ala	Ala	Ser	Glu	Pro	Gly	Ile	Thr	
				290				295						300		
gat	gcg	ctg	gtg	cgt	gcg	gcg	ggc	gat	atg	gca	cga	cgc	ctg	ctt	gat	1261
Asp	Ala	Leu	Val	Arg	Ala	Ala	Gly	Asp	Met	Ala	Arg	Arg	Leu	Leu	Asp	
			305				310						315			
ctg	ccc	cct	gaa	gaa	gca	tgaagggcct	ttttgccnna	cgggtgcgtg								1309
Leu	Pro	Pro	Glu	Glu	Ala											
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1360

<210> 17

<211> 323

<212> PRT

<213> Pseudomonas putida

<400> 17

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			20					25					30		

Gln	Gly	Leu	Pro	Val	Val	Phe	Ile	His	Gly	Gly	Pro	Gly	Ala	Gly	Cys
		35					40					45			

Asp	Ala	Asn	Ser	Arg	Cys	Tyr	Phe	Asp	Pro	Asn	Leu	Tyr	Arg	Ile	Val
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Thr	Phe	Asp	Gln	Arg	Gly	Cys	Gly	Arg	Ser	Thr	Pro	Arg	Ala	Ser	Leu
65					70					75					80

Glu	Asn	Asn	Thr	Thr	Trp	Asp	Leu	Val	Ala	Asp	Leu	Glu	Arg	Ile	Arg
				85					90					95	

Glu	His	Leu	Gly	Ile	Glu	Lys	Trp	Val	Leu	Phe	Gly	Gly	Ser	Trp	Gly
			100					105					110		

Ser	Thr	Leu	Ala	Leu	Ala	Tyr	Ala	Gln	Thr	His	Pro	Asp	Arg	Val	Leu
		115					120					125			

Gly	Leu	Ile	Val	Arg	Gly	Ile	Phe	Leu	Ala	Arg	Pro	Gln	Asp	Ile	Gln
	130					135					140				

Trp	Phe	Tyr	Gln	Ala	Gly	Ala	Ser	Arg	Leu	Phe	Pro	Asp	Tyr	Trp	Gln
145					150					155					160

Asp Tyr Ile Ala Pro Ile Pro Ala Glu Glu Arg His Asp Met Ile Ser
165 170 175

Ala Tyr His Lys Arg Leu Thr Gly Asn Asp Gln Ile Ala Gln Met His
180 185 190

Ala Ala Lys Ala Trp Ser Thr Trp Glu Gly Arg Met Leu Gly Leu Cys
195 200 205

Pro Ser Pro Gln Leu Ile Glu Arg Phe Ser Glu Pro Gln Arg Ala Leu
210 215 220

Ser Ile Ala Arg Ile Glu Cys His Tyr Phe Thr Asn Asn Ser Phe Leu
225 230 235 240

Glu Pro Asn Gln Leu Ile Arg Asp Met His Lys Ile Ala His Leu Pro
245 250 255

Gly Ile Ile Val His Gly Arg Tyr Asp Met Ile Cys Pro Leu Asp Asn
260 265 270

Ala Trp Glu Leu His Gln Ala Trp Pro Asn Ser Glu Leu Gln Val Ile
275 280 285

Arg Glu Ala Gly His Ala Ala Ser Glu Pro Gly Ile Thr Asp Ala Leu
290 295 300

Val Arg Ala Ala Gly Asp Met Ala Arg Arg Leu Leu Asp Leu Pro Pro
305 310 315 320

Glu Glu Ala